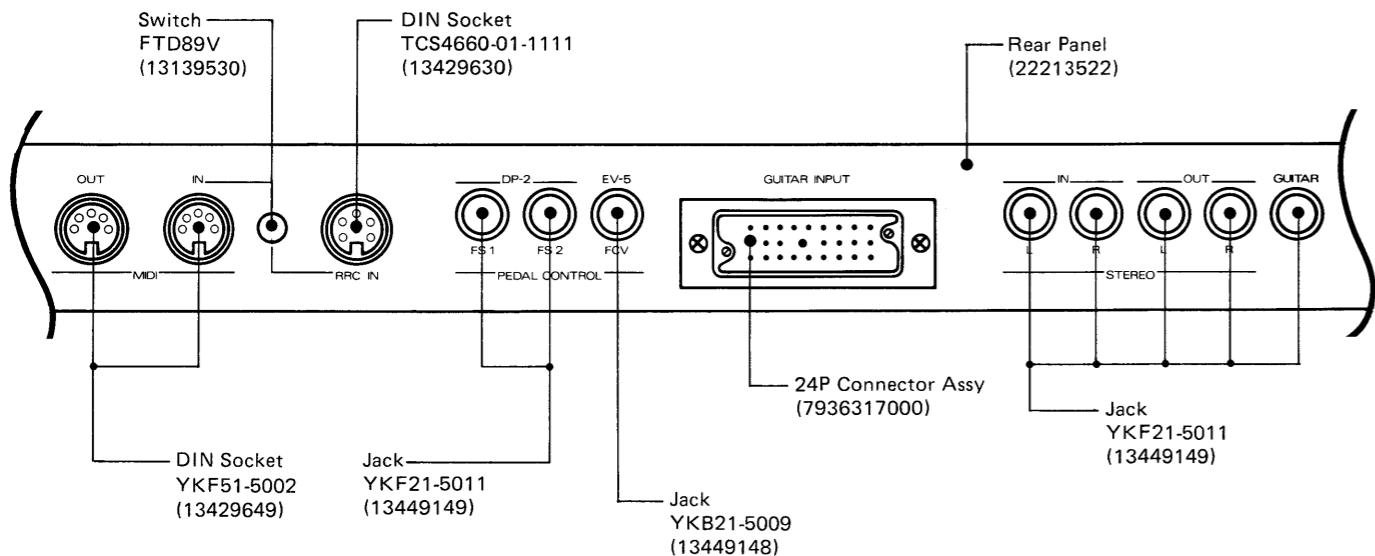
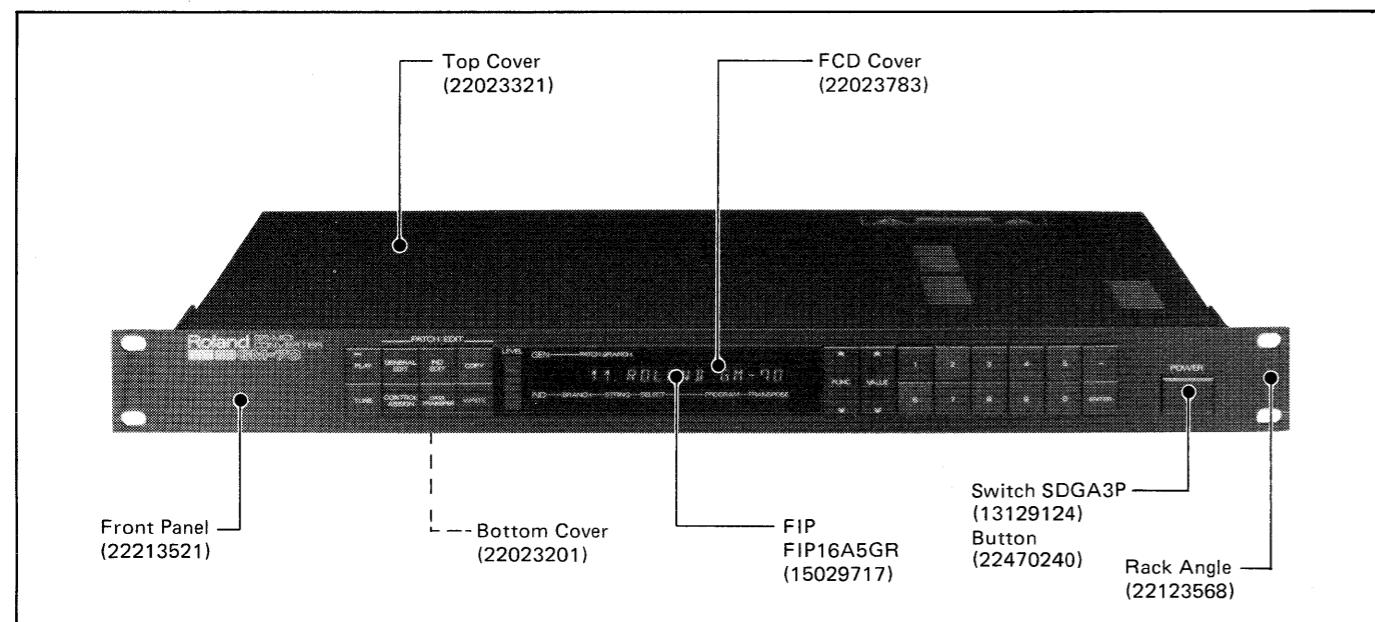
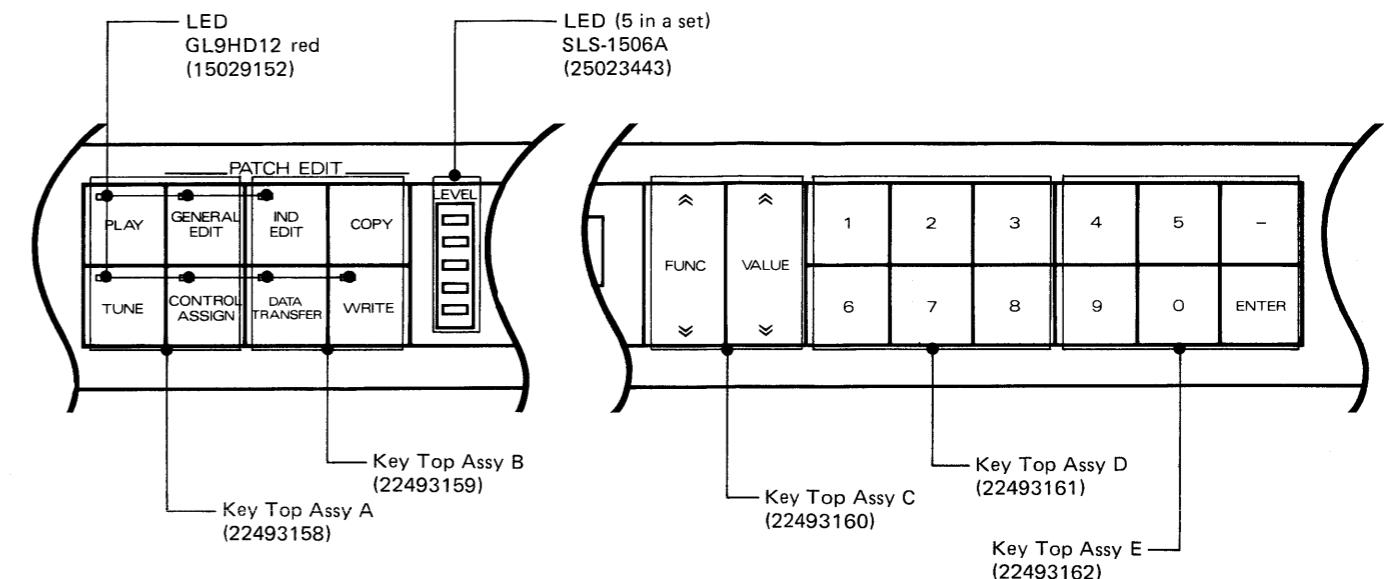


# GM-70 SERVICE NOTES

First Edition

## SPECIFICATIONS

|                   |  |
|-------------------|--|
| OUTPUT            | : GUITAR 8KΩ<br>MIX L 8KΩ<br>R 8KΩ   |
| INPUT             | : SYNTH L 51KΩ<br>R 51KΩ   |
| RRC IN            | : FC-100 only  |
| POWER CONSUMPTION | : 100V 19W<br>120V 22W<br>220V 22W<br>240V 22W   |
| DIMENSIONS        | : 482 (W) x 276 (D) x 44 (H) mm<br>19 (W) x 10-7/8 (D) x 1-3/4 (H) in.   |
| WEIGHT            | : 4 kg<br>8 lb. 13 oz.   |
| ACCESSORIES       | : CONNECTION CORD LP-25 (Part No. 23430675S0) x 1<br>MIDI CABLE 2.5M (Part No. 23485135) x 1<br>OWNER's MANUAL x 1 |
| OPTIONS           | : FOOT CONTROLLER FC-100<br>EXPRESSION PEDAL EV-5<br>CARRYING CASE   |



## TABLE OF CONTENTS

|                    | Page |
|--------------------|------|
| PARTS LIST         | 2    |
| EXPLODED VIEW      | 3    |
| BLOCK DIAGRAM      | 4    |
| BRIEF DESCRIPTION  | 5    |
| CHANGE INFORMATION | 5    |
| SWITCH BOARD       | 6,7  |
| EMI BOARD          | 6,7  |
| POWER SUPPLY BOARD | 6,7  |
| MAIN BOARD         | 6,7  |
| IC DATA            | 8    |
| MIDI               | 8-10 |

**PARTS LIST****PANEL, CASING**

|          |                 |
|----------|-----------------|
| 22023321 | Top Cover       |
| 22023201 | Bottom Cover    |
| 22193896 | Front Holder    |
| 22193897 | Side Holder L   |
| 22193898 | Side Holder R   |
| 22193899 | P.T. Holder     |
| 22193900 | Power SW Holder |
| 22213521 | Front Panel     |
| 22213522 | Rear Panel      |
| 22123568 | Rack Angle      |
| 22023783 | FCD Cover       |

**BUTTON**

|            |                |
|------------|----------------|
| 22493158   | Key Top Assy A |
| 22493159   | Key Top Assy B |
| 22493160   | Key Top Assy C |
| 22493161   | Key Top Assy D |
| 22493162   | Key Top Assy E |
| 2247024000 | Button blk     |

POWER

**SWITCH**

|          |                 |                |
|----------|-----------------|----------------|
| 13139530 | FTD89V (toggle) | RRC IN-MIDI IN |
| 13129733 | SKHHBE (tact)   |                |
| 13129124 | SDGA3P (push)   | POWER          |

**JACK, SOCKET**

|          |                 |  |
|----------|-----------------|--|
| 13449149 | YKF21-5011      | Jack (MONO)<br>INPUT, OUTPUT, GUITAR, FS-1, FS-2 |
| 13449148 | YKF21-5009      | Jack (STEREO)<br>FCV                             |
| 13429649 | YKF51-5002      | DIN Socket<br>MIDI                               |
| 13429630 | TCS4660-01-1111 | DIN Socket<br>RRC IN                             |

**POWER TRANSFORMER**

|            |           |          |
|------------|-----------|----------|
| 22453461N0 | 245-461N0 | 100,117V |
| 22453462D0 | 245-462D0 | 220,240V |

**PCB ASSY**

|            |                             |  |
|------------|-----------------------------|--|
| 7936310000 | Main Board                  | (pcb 22923380)                           |
| 7936314000 | Switch Board                | (pcb 22923382)                           |
| 7936308100 | Power Supply Board          | (pcb 22923381)                           |
| 7936316000 | EMI Board (w/24P connector) | (pcb 22923433)<br>See CHANGE INFORMATION |

**TRANSISTOR**

|          |             |                           |
|----------|-------------|---------------------------|
| 15119108 | 2SA798G     |                           |
| 15129613 | 2SD1207S    |                           |
| 15129169 | 2SC945R     |                           |
| 15139118 | 2SK-30AGR   | FET                       |
| 15129164 | DTC114ES-TP | w/built-in bias resistors |
| 15119141 | DTA114ES-TP | w/built-in bias resistors |

**DIODE**

|          |            |                  |
|----------|------------|------------------|
| 15019126 | 1SS-133-77 |                  |
| 15019323 | 04AZ9.1X   | zener            |
| 15019325 | 04AZ39R    | zener            |
| 15029152 | GL9HD12    | LED red          |
| 25023443 | SLS-1506A  | LED              |
| 15019243 | 1B4B1      | rectifier bridge |

LEVEL METER

**FIP**

|          |             |                             |
|----------|-------------|-----------------------------|
| 15029717 | FIP16A5GR   | Fluorescent Indicator Panel |
| 22263383 | FIP Cushion |                             |
| 22193938 | FIP Holder  |                             |

**COIL**

|          |              |             |
|----------|--------------|-------------|
| 12449229 | FKOB-160MH15 | Line Filter |
| 12449251 | 244-251      | FIP Driver  |

**CRYSTAL**

|          |              |  |
|----------|--------------|--|
| 12389746 | HC49/V 12MHz |  |
| 12389738 | CSB400P      |  |

**IC**

|            |              |  |
|------------|--------------|--|
| 15179246   | 8095-90      | CPU  |
| 15179201   | μPD7537C-104 | 4-Bit NMOS CPU                                 |
| 15229845   | MSM75H016-SS | Gate Array                                     |
| 15179803   | M52M27C128K  | EP ROM A                                       |
| 15179804   | M52M27C128K  | EP ROM B                                       |
| 15179334   | TC5564PL     | SRAM   |
| 15219139   | PST518A      | Reset  |
| 15229706   | TLP552       | Optoisolator                                   |
| 15189154   | TL064CN      | OP Amp   |
| 15189102   | 4558DD       | OP Amp   |
| 15189197   | 5532D        | OP Amp   |
| 15169551B0 | M74HC174P    | Hex D Flip-Flops with Clear                    |
| 15169539B0 | M74HC139P    | Dual 2-to-4 Line Decoder                       |
| 15169550B0 | M74HC138P    | 3-to-8 Line Decoder                            |
| 15169554B0 | M74HC374P    | 3 State Octal D-type Flip-Flop                 |
| 15169543B0 | M74HC373P    | 3 State Octal D-type Latch                     |
| 15169552B0 | M74HC245P    | Octal 3 State Transceiver                      |
| 15169513B0 | M74HC74P     | Dual D Flip-Flop with Preset and Clear         |
| 15169549B0 | M74HC32P     | Quad 2-Input OR Gate                           |
| 15169515B0 | M74HCOOP     | Quad 2-Input NAND Gate                         |
| 15159129H0 | HD14053BP    | Triple 2-Channel Multiplexer/<br>Demultiplexer |
| 15159113Z0 | HD14051B     | Single 8-Channel Multiplexer/<br>Demultiplexer |
| 15159505   | TC40H004P    | Hex Inverter                                   |
| 15199137   | AN7805F      | Voltage Regulator                              |
| 15199133   | AN7815F      | Voltage Regulator                              |
| 15199134   | AN7915F      | Voltage Regulator                              |

**LITHIUM BATTERY**

|          |        |            |
|----------|--------|------------|
| 12569252 | CR2450 | 3V 500 μAH |
|----------|--------|------------|

**AC CORD, INLET**

|            |               |          |          |
|------------|---------------|----------|----------|
| 13439801W0 | VFF 2.5M      | Cord     | 100V     |
| 12369504   | SR-4N-4       | Bushing  | 100V     |
| 22193932   | 219-932       | Holder   | 100V     |
| 13439812F0 | JC-704-J01    | Cord Set | 117V     |
| 13439813F0 | EC-210-J06    | Cord Set | 220V     |
| 23495110   | 5722 660 4606 | Cord Set | 240V     |
| 13429710   | 2P-PA126      | Inlet    | 117/220V |
| 13429708   | 3P-CM-3       | Inlet    | 240V     |

**RESISTOR ARRAY**

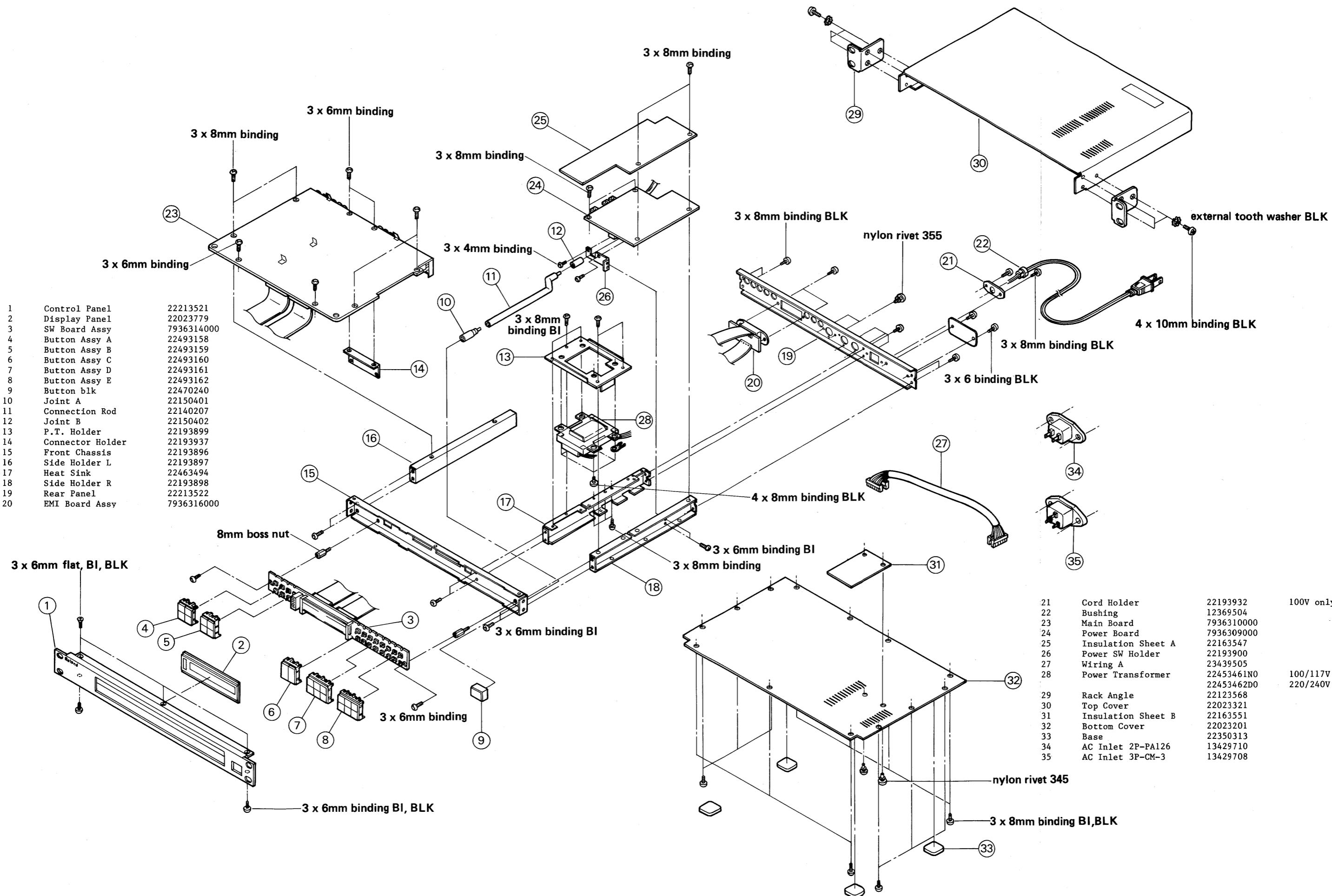
|          |            |          |
|----------|------------|----------|
| 13919308 | RMLS6-103J | 10KΩ x 6 |
| 13919310 | RMLS8-103J | 10KΩ x 8 |

**CAPACITOR**

|            |                    |                    |
|------------|--------------------|--------------------|
| 13519301   | DD312-957BC104Z25V | 0.1μ/25V           |
| 13659204   | ECES1CU472D        | 4700μ/16V          |
| 13639194S0 | 35MV1000           | 1000μ/35V          |
| 13529104   | DE7150F472MVA1     | Power Supply Board |

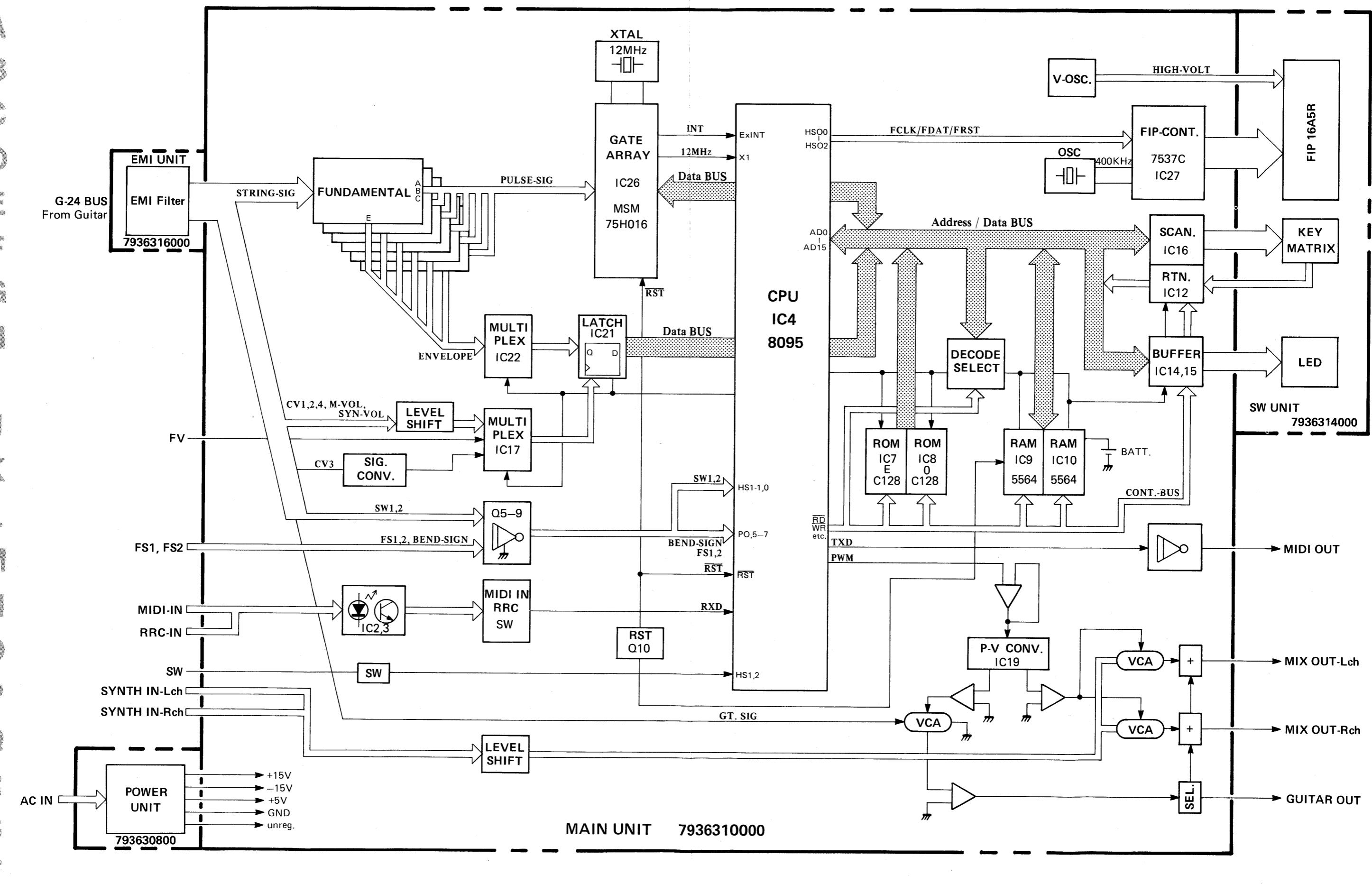
**CONNECTOR**

## **EXPLODED VIEW**



1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39

## BLOCK DIAGRAM

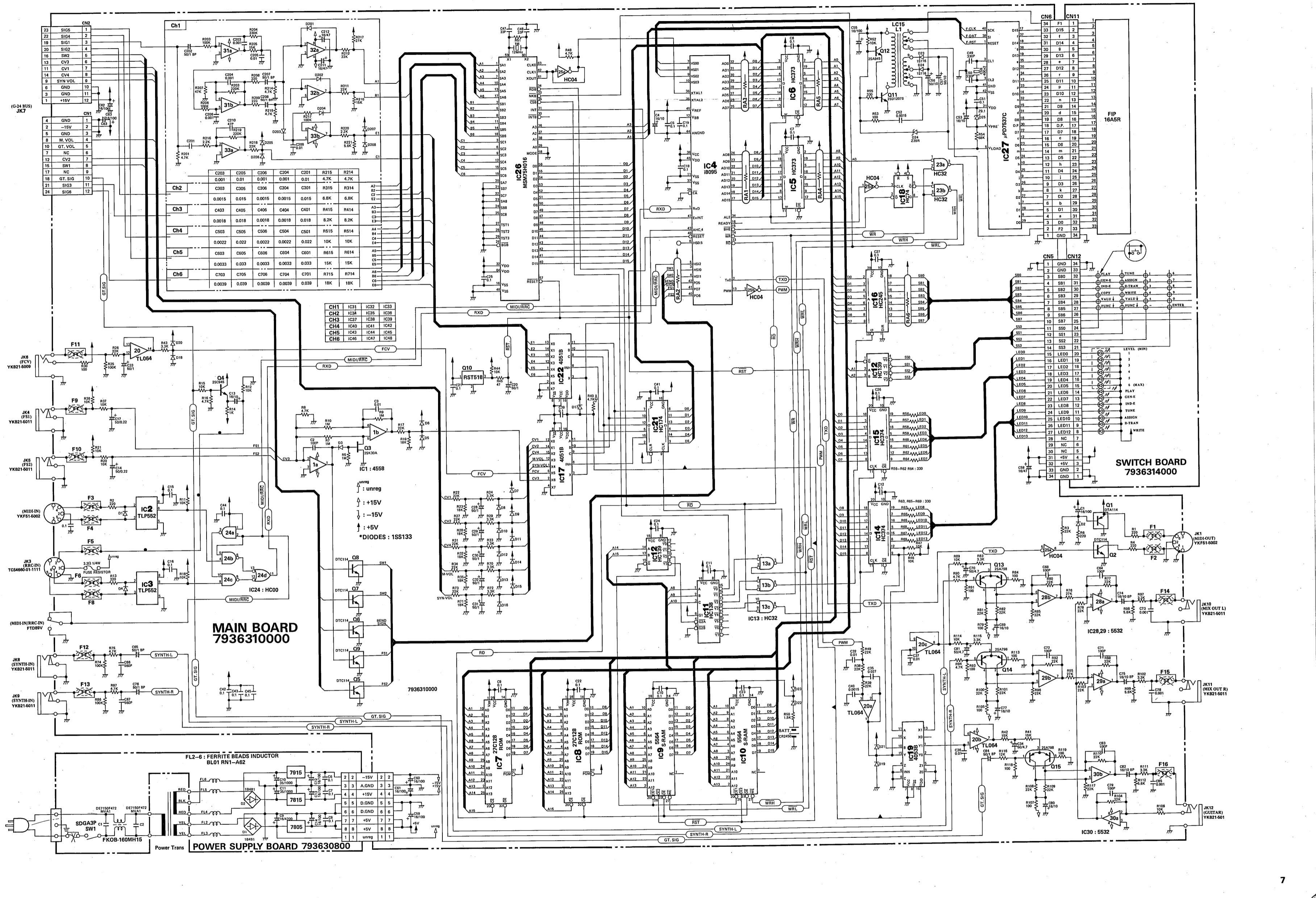




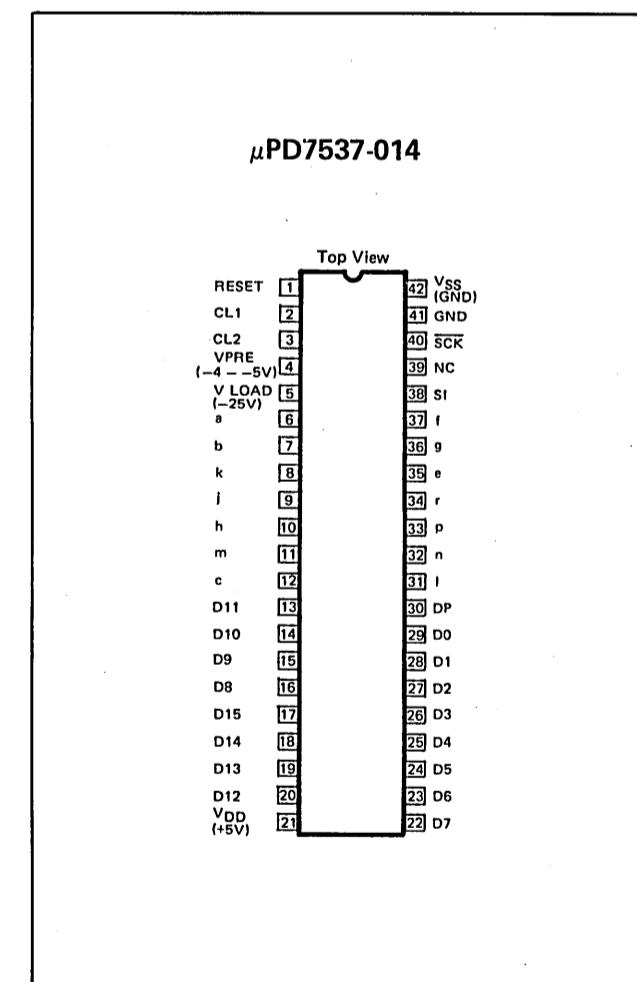
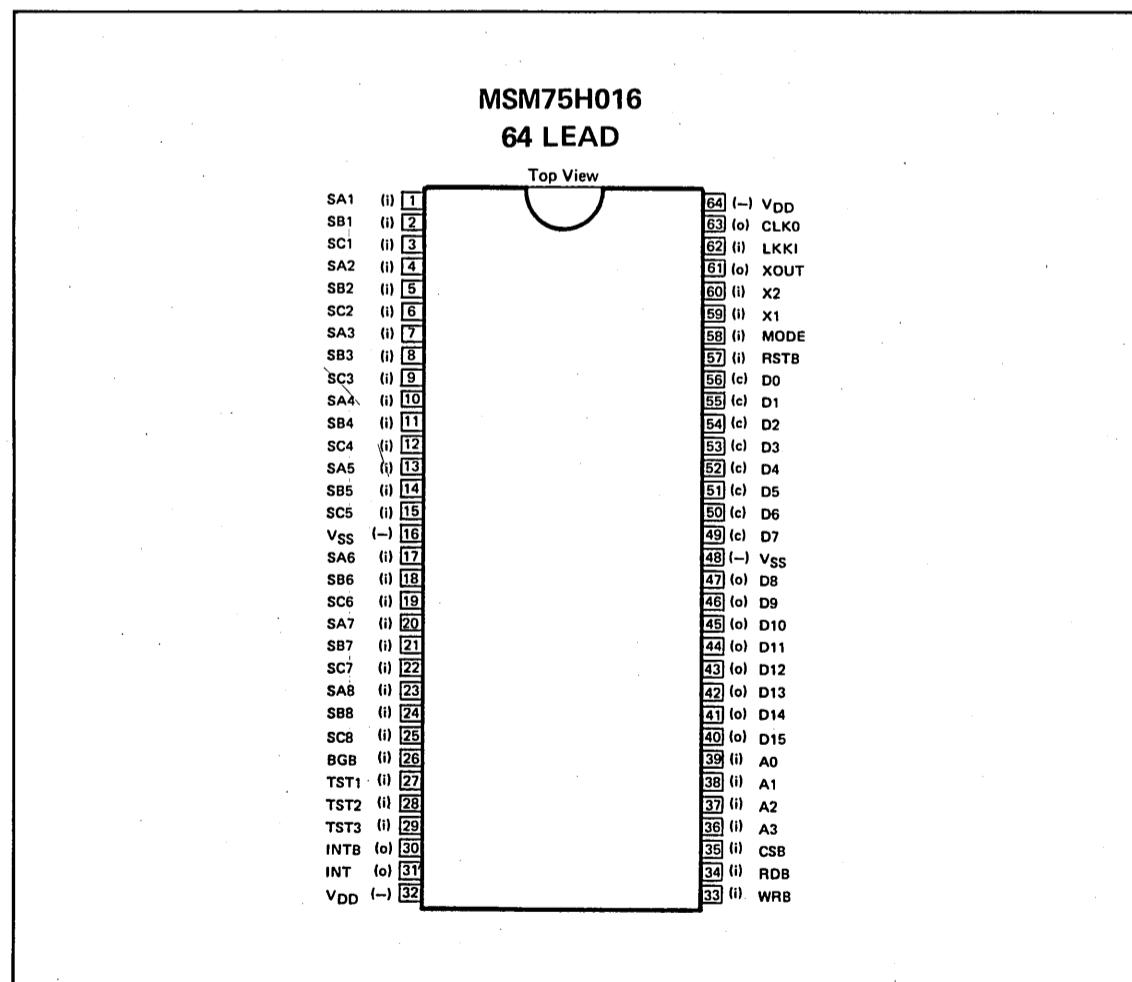
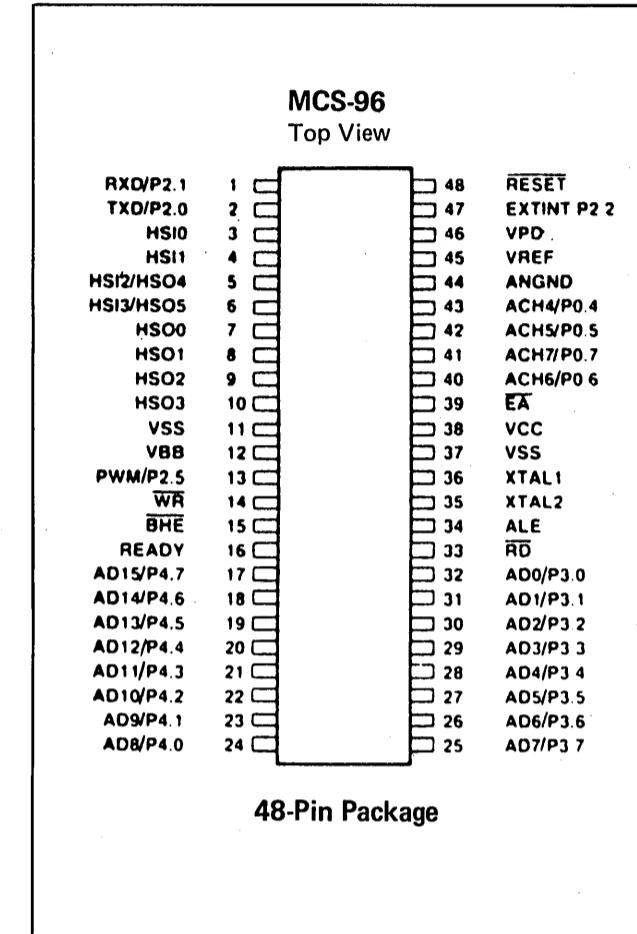
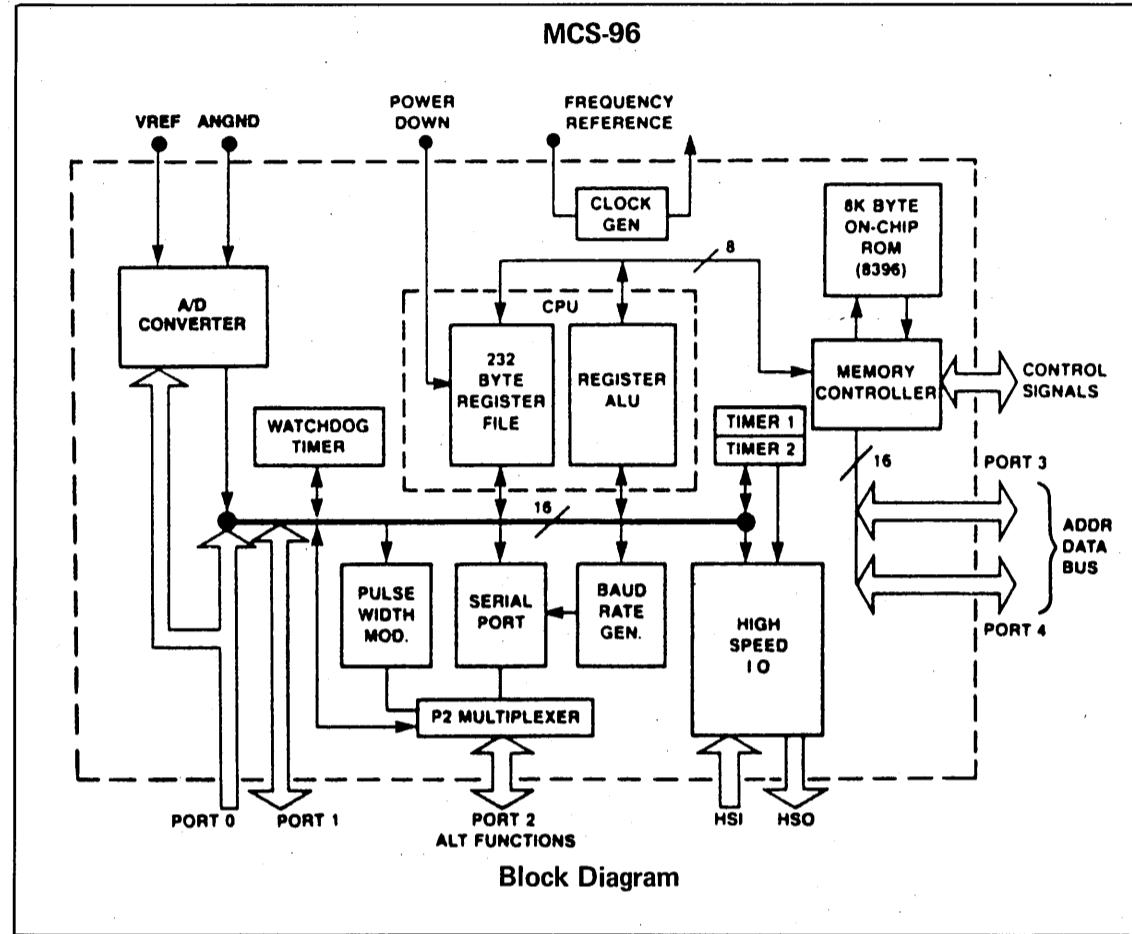


1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48

## CIRCUIT DIAGRAM



## IC DATA



[GR Guitar - MIDI Interface ] Date : Nov. 11 1986  
Model GM-70 MIDI Implementation Chart Version : 1.00

| Function ...             |  | Transmitted  | Recognized           | Remarks       |
|--------------------------|--|--|----------------------|---------------|
| Basic Channel            | Default Changed  | 1 - 16<br>1 - 16   | 1 - 16<br>1 - 16     | Memorized     |
| Mode                     | Default Messages Altered   | 3, 4<br>OMNI, MONO, POLY<br>*****  | 3<br>x<br>x          | Memorized     |
| Note Number   True voice |  | 0 - 127<br>*****   | x<br>x               |               |
| Velocity                 | Note ON<br>Note OFF  | o 9n, v=1 - 127<br>x 9n, v=0   | x<br>x               |               |
| After Touch              | Key's Ch's   | x<br>o   | x<br>x               |               |
| Pitch Bender             |  | o  | x                    | Range: 1 - 64 |
| Control Change           |  | 7<br>0 - 95  | o Volume<br>o        | x<br>x        |
| Prog Change   True #     |  | o 0 - 127<br>*****   | o 0 - 127<br>0 - 127 |               |
| System Exclusive         |  | o  | o                    | **            |
| System Common            | Song pos   Song sel<br>Song sel   Tune   | x<br>x<br>x  | x<br>x<br>x          |               |
| System Real Time         | Clock   Commands   | x<br>x   | x<br>x               |               |
| Aux Mes- sages           | Local ON/OFF   All Notes OFF<br>All Notes OFF   Active Sense<br>Active Sense   Reset | x<br>o<br>x<br>x   | x<br>x<br>x<br>x     |               |
| Notes                    |  | * Any Control Number can be selected.<br>( The value is shown in 7 bits. )<br>** Dump/Load int the internal memory.<br>(Roland 'one way' format) |                      |               |

Mode 1 : OMNI ON, POLY      Mode 2 : OMNI ON, MONO      o : Yes  
 Mode 3 : OMNI OFF, POLY      Mode 4 : OMNI OFF, MONO      x : No

GM-70 MIDI IMPLEMENTATION version 1.00 Nov.11 1986

\*\*\* GM-70 MIDI IMPLEMENTATION \*\*\*  
 version 1.00  
 Nov.11 1986

## 1. TRANSMITTED DATA

| Status    | Second      | Third     | Description  |
|-----------|-------------|-----------|--|
| 1001 nnnn | 0kkk kkkk   | 0000 0000 | Note OFF<br>kkkkkkk = 0 - 127 *1                               |
| 1001 nnnn | 0kkk kkkk   | 0vvv vvvv | Note ON<br>kkkkkkk = 0 - 127<br>vvvvvvv = 1 - 127 *1           |
| 1011 nnnn | 0000 0111   | 0vvv vvvv | Volume<br>vvvvvvv = 0 - 127 *1                                 |
| 1011 nnnn | 0ccc cccc   | 0vvv vvvv | Control change<br>ccccccc = 0 - 95<br>vvvvvvv = 0 - 127 *1, *2 |
| 1100 nnnn | 0opp oppp   |           | Program change<br>oppopp = 0 - 127 *1                          |
| 1101 nnnn | 0vvv vvvv   |           | Channel pressure<br>vvvvvvv = 0 - 127 *1                       |
| 1110 nnnn | 0bbb bbbb   | 0bbb bbbb | Pitch bender change *1   |
| 1011 nnnn | 0111 1011   | 0000 0000 | All NOTES OFF *1   |
| 1011 nnnn | 0111 1100   | 0000 0000 | OMNI OFF *1  |
| 1011 nnnn | 0111 1110   | 0000 0110 | MONO ON (m = 6) *1   |
| 1011 nnnn | 0111 1111   | 0000 0000 | POLY ON *1   |
| 1111 0000 | ... . . . . | 1111 0111 | System exclusive *3  |

## Notes :

\*1 nnnn represents the MIDI channel number assigned to each Branch of A,B,C and D.

\*2 Any Control Number can be selected.

\*3 Bulk Dump(or Load) the internal memory. See 3.EXCLUSIVE.

\* At power-up,

The following message is transmitted to all the Branches.

The mode selected in Patch A 11

The following messages are sent to all the channels.

The current volume value  
Program Number set in Patch A 11

\* When a new Patch is selected, the following messages are transmitted.

A) Through the previous channel  
NOTE OFF for notes have been set to ON  
All Notes OFF  
Pitch Bender Change : center  
Modulation(Control 1) : 0  
Volume (Control 7) : maximum (127)  
Damper 1(Control 64) : 0  
Channel Pressure : 0  
OMNI OFF, POLY ON

B.) Through the new channel  
OMNI OFF  
POLY or MONO

Even if the strings previously played are still vibrating, the Channel Voice messages are not transmitted unless a new string is played after a new Patch is selected.

## 2. RECOGNIZED RECEIVE DATA

| Status    | Second      | Third     | Description                           |
|-----------|-------------|-----------|---------------------------------------|
| 1100 nnnn | 0opp oppp   |           | Program change<br>oppopp = 0 - 127 *1 |
| 1111 0000 | ... . . . . | 1111 0111 | System exclusive *2                   |

## Notes :

\*1 nnnn is the value of Control Channel stored in the System memory.  
The value can be changed freely, but the mode is fixed to OMNI OFF.

\*2 Bulk Dump(or Load) the internal memory.  
( See 3. EXCLUSIVE. )

## 3. EXCLUSIVE

## 3.1

## 3.1.1 Exclusive Description

System Exclusive is used to Dump or Load into the internal memory. The format to be used is Roland's 'One Way Transfer' with 21 bit logical address.

Standard Format (treat this as a block)

| Byte        | Description   |
|-------------|---|
| a 1111 0000 | Exclusive status  |
| b 0100 0001 | Roland ID #   |
| c 0000 nnnn | Device-ID # = control channel<br>where nnnn + 1 = channel # |
| d 0001 0001 | Model-ID # ( GM-70 )  |
| e 0001 0010 | Command-ID # ( one way transfer data set )                  |
| f 0aaa aaaa | 21 bit logical address MSB                                  |
| g 0aaa aaaa | :   |
| h 0aaa aaaa | LSB   |
| i 0000 dddd | Data bytes  |
| j 0eee eeee | Checksum  |
| k 1111 0111 | End of System Exclusive                                     |

Summed value of the all bytes between Command-ID and EOX must be 00H (7 bits). It does include Command-ID and EOX.

In the GM-70's specifications, Dump (or Load) message is not sent until it is selected through panel operation. This means that under usual performance condition, the Exclusive is not sent or received.

## 3.1.2 Data Format

The following are the contents of data transmitted and received.

## One Patch Memory(80 bytes)

## Address Descriptions

|         |  |
|---------|--|
| 0 - 11  | 12 letter name. ASCII characters   |
| 12 - 15 | Undefined(reserved, standard is 0)   |
| 16      | Branch A, 1st string bit 7:Select(1=ON)<br>bit 6 to 0: Program Change Numbers            |
| 17      | Branch A, 1st string Transpose   |
| 18 - 19 | Branch A, 2nd string<br>(the contents of data are the same as the 1st string; 16 and 17) |
| 20 - 21 | Branch A, 3rd string<br>(the contents of data are the same as the 1st string; 16 and 17) |
| 22 - 23 | Branch A, 4th string<br>(the contents of data are the same as the 1st string; 16 and 17) |
| 24 - 25 | Branch A, 5th string<br>(the contents of data are the same as the 1st string; 16 and 17) |
| 26 - 27 | Branch A, 6th string<br>(the contents of data are the same as the 1st string; 16 and 17) |
| 28      | branch A bit 5: 1 = OFF<br>bit 4: 1 = POLY, 0 = MONO<br>bit 3 - 0 : Basic Channel        |
| 29      | Branch A Bend Range  |
| 30      | Branch A Velocity Curve  |
| 31      | Branch A Level   |
| 32 - 47 | Branch B (the contents of data are the same as the Branch A; 16 to 31)                   |
| 48 - 63 | Branch C (the contents of data are the same as the Branch A; 16 to 31)                   |
| 64 - 79 | Branch D (the contents of data are the same as the Branch A; 16 to 31)                   |

Between two Blocks, An Inter Block Gap(more than 20ms) is placed to allow low speed receivers to recognize the signals. The number of the bytes in the above mentioned MIDI messages are as follows.

```
all data : 21834 bytes
64 patch : 10880 bytes
system : 74 bytes
```

### 3.2.1 Entire Data in Memory

First, the Patch Memory data 1 to 128 is sent, then the System Memory. The form and logical address of each Block are as follows.

```
block-001 (patch 11)
  FO 41 0n 11 12 00 00 00 [.data 160bytes.] sum F7
block-002 (patch 12)
  FO 41 0n 11 12 00 01 20 [.data 160bytes.] sum F7
block-003 (patch 13)
  FO 41 0n 11 12 00 02 40 [.data 160bytes.] sum F7
  :
  :
block-128 (patch -88)
  FO 41 0n 11 12 01 1E 60 [.data 160bytes.] sum F7
block-129 (system)
  FO 41 0n 11 12 01 20 00 [.data 64bytes..] sum F7
```

### 3.2.2 First 64 Patches

The form and logical address of each Block are as follows.

```
block-001 (patch 11)
  FO 41 0n 11 12 02 00 00 [.data 160bytes.] sum F7
block-002 (patch 12)
  FO 41 0n 11 12 02 01 20 [.data 160bytes.] sum F7
block-003 (patch 13)
  FO 41 0n 11 12 02 02 40 [.data 160bytes.] sum F7
  :
  :
block-064 (patch 88)
  FO 41 0n 11 12 02 4E 60 [.data 160bytes.] sum F7
```

### System Memory (32 bytes)

#### Address Descriptions

|         |  |
|---------|--|
| 0       | CV 1 Assign  |
| 1       | CV 1 Mode  |
| 2 - 3   | CV 2 (the contents of data are the same as CV 1's) |
| 4 - 5   | CV 3 (the contents of data are the same as CV 1's) |
| 6 - 7   | CV 4 (the contents of data are the same as CV 1's) |
| 8 - 9   | SW 1 (the contents of data are the same as CV 1's) |
| 10 - 11 | SW 2 (the contents of data are the same as CV 1's) |
| 12 - 13 | FCV (the contents of data are the same as CV 1's)  |
| 14 - 15 | FS 1 (the contents of data are the same as CV 1's) |
| 16 - 17 | FS 2 (the contents of data are the same as CV 1's) |
| 18 - 19 | RCV (the contents of data are the same as CV 1's)  |
| 20 - 21 | RSW (the contents of data are the same as CV 1's)  |
| 22      | Control Channel                                    |
| 23      | Undefined(reserved, standard is 00)                |
| 24      | Master Tune  |
| 25 - 31 | Undefined(reserved, standard is 00)                |

### 3.2 TRANSMIT

One of the following data groups can be transmitted through panel operation.

- 1) Entire memory data
- 2) First half(64 Patches) of the 128 Patch Memories  
(11 to 88)
- 3) Latter half(64 Patches) of the 128 Patch Memories  
(-11 to -88)
- 4) System Memory

Different address is transmitted depending on which of the above four data groups is selected.

The data in one Block is transmitted as follows:

- 1) 1 byte(=8 bits) is divided into two(4 bits each), transmitted two data groups.
- 2) A Patch consists of 80 bytes and sent by a block including 160 data bytes.
- 3) The System Memory consists of 32 bytes and sent by a Block including of 64 data bytes.

3.3.1 The following conditions should be fulfilled to start receiving data.

\* Roland format starts correctly.(If not, the GM-70 will wait until the correct Block is transmitted.)

\*The received Device ID is equal to the Control Channel. (If not, the GM-70 will wait until the correct Block is transmitted.)

\*The address of the first Block is one of the following. (If not, the GM-70 shows DATA ERROR in the Display and returns to the playing mode.)

Address(3 bytes) MSB LSB

Entire Data

First Half Patches(64 Patches)

Latter Half Patches(64 Patches)

System Memory

### 3.2.3 Latter 64 Patches

The form and logical address of each Block are as follows.

```
block-001 (patch -11)
  FO 41 0n 11 12 02 50 00 [.data 160bytes.] sum F7
block-002 (patch -12)
  FO 41 0n 11 12 02 51 20 [.data 160bytes.] sum F7
block-003 (patch -13)
  FO 41 0n 11 12 02 52 40 [.data 160bytes.] sum F7
  :
  :
block-064 (patch -88)
  FO 41 0n 11 12 03 1E 60 [.data 160bytes.] sum F7
```

### 3.2.4 System Memory Data

Contains only one Block. The form and address are as follows.

```
block-001 (system)
  FO 41 0n 11 12 03 20 00 [.data 64bytes..] sum F7
```

### 3.3 Receive

Enter to the Receive stand-by mode by operating the panel.

\*Select whether to receive the first or latter 64 Patches. (See 3.2 Transmit, 3.2.2 and 3.2.3.) This procedure is not necessary when receiving the entire data of memory.

3.3.2 Depending on the first address received, the GM-70 stores the data into a proper location in memory. After this, the following conditions should be fulfilled.

\*Roland format being received is correct. (If not, the GM-70 will wait until the correct Block is transmitted.)

\*The received Device ID is equal to the Control Channel. (If not, the GM-70 will wait until the correct Block is transmitted.)

\*The next logical address is correct. (If not, the GM-70 shows DATA ERROR in the Display and returns to the playing mode.)

\* Check Sun is correct. (If not, the GM-70 shows DATA ERROR in the Display and returns to the playing mode.)

\* EOX follows at the end. (If not, the GM-70 shows DATA ERROR in the Display and returns to the playing mode.)

\* The correct number of the Blocks received. (When less Blocks are received: the GM-70 waits until all are received.)

When more Blocks are transmitted, the GM-70 ignores the exceeding Blocks.

3.3.3 Even if the loading goes wrong in the middle, the data received so far is stored into memory.

3.3.4 Loading can be aborted at any time by pushing any button on the panel.

3.3.5 The Control Channel resides in the System Memory. Therefore, the Control Channel (Device ID) is not changed until the System Memory Blocks is fully received.